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COMPARATIVE PERFORMANCE TEST OF X. B. I.-A EQUIPPED WITH HIGH COMPRESSION WRIGHT MODEL "H" AND PACKARD 1237 ENGINES

(PERFORMANCE TEST REPORT No. 67)

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COMPARATIVE PERFORMANCE TEST OF X. B. I.-A. EQUIPPED WITH HIGH COMPRESSION WRIGHT MODEL "H" AND PACKARD 1237 ENGINES.

OFFICIAL PERFORMANCE TEST—SUMMARY OF RESULTS.

AUGUST 11, 1921.

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Airplane: X. B. I.-A.
No.: P-90.
Type: X.
Engine: Wright, model "H," high compression.
Propeller: X-24705.
Equipped as corps observation.
Weight empty (including water): 2,155 pounds.
Armament and equipment: 611 pounds.
Crew: 360 pounds.
Gasoline: 1,598 pounds.
Oil: 167 pounds.
Weight loaded: 3,791 pounds.
Weight per square foot: 935 pounds.
Weight per horsepower: 10.50 pounds (360 horsepower at 1,870 revolutions per minute).
Fineness: 108 Ae-9.8.

Standard altitude in feet.	Climb.			Speed.	
	Time in minutes.	R. p. m.	Rate feet per minute.	M. p. h.	R. p. m.
0	0	1,730	1,035	129.5	1,870
6,500	7.5	1,708	715	127.5	1,845
10,000	13.7	1,695	540	124.7	1,825
15,000	25.6	1,675	295	117.8	1,785
20,000		1,646	48	101.0	1,685
25,000					
¹ 18,950	47.5	1,653	100	106.6	1,715
² 21,000		1,640	0	87.0	1,640

¹ Service ceiling.

² Absolute ceiling.

Minimum speed at sea-level (lowest throttle): 62 m. p. h.
Landing speed: ———.

¹ Endurance, full throttle: $\frac{1}{2}$ hour at ground and 4 hours at 10,000 feet.

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Airplane: X. B. I.-A.

No.: P-180.

Type: X.

Engine: Packard 1237.

Propeller: X-24705.

Equipped as corps observation.

Weight empty (including water): 2,305 pounds.

Armament and equipment: 611 pounds.

Crew: 360 pounds.

Gasoline: 1,638 pounds.

Oil: 174 pounds.

Weight loaded: 3,988 pounds.

Weight per square foot: 9.8 pounds (406 square feet).

Weight per horsepower: 11.4 pounds (350 horsepower at 1,900 revolutions per minute).

Fineness: 106 Ae-2 10.6.

Standard altitude in feet.	Climb.			Speed.	
	Time in minutes.	R. p. m.	Rate feet per minute.	M. p. h.	R. p. m.
0		1,760	940	125.0	1,900
6,500	8.5	1,727	610	121.5	1,850
10,000	15.3	1,708	434	118.0	1,810
15,000	32.8	1,680	180	109.5	1,740
20,000					
25,000					
¹ 16,550	44.3	1,670	100	104.5	1,710
² 18,500		1,655	0	89	1,655

¹ Service ceiling.

² Absolute ceiling.

Minimum speed at sea level (lowest throttle): 66 m. p. h.

Landing speed: ———.

¹ Endurance, full throttle: $\frac{1}{2}$ hour at ground and 4 hours at 10,000 feet.

² P-180 has a larger radiator than P-90.

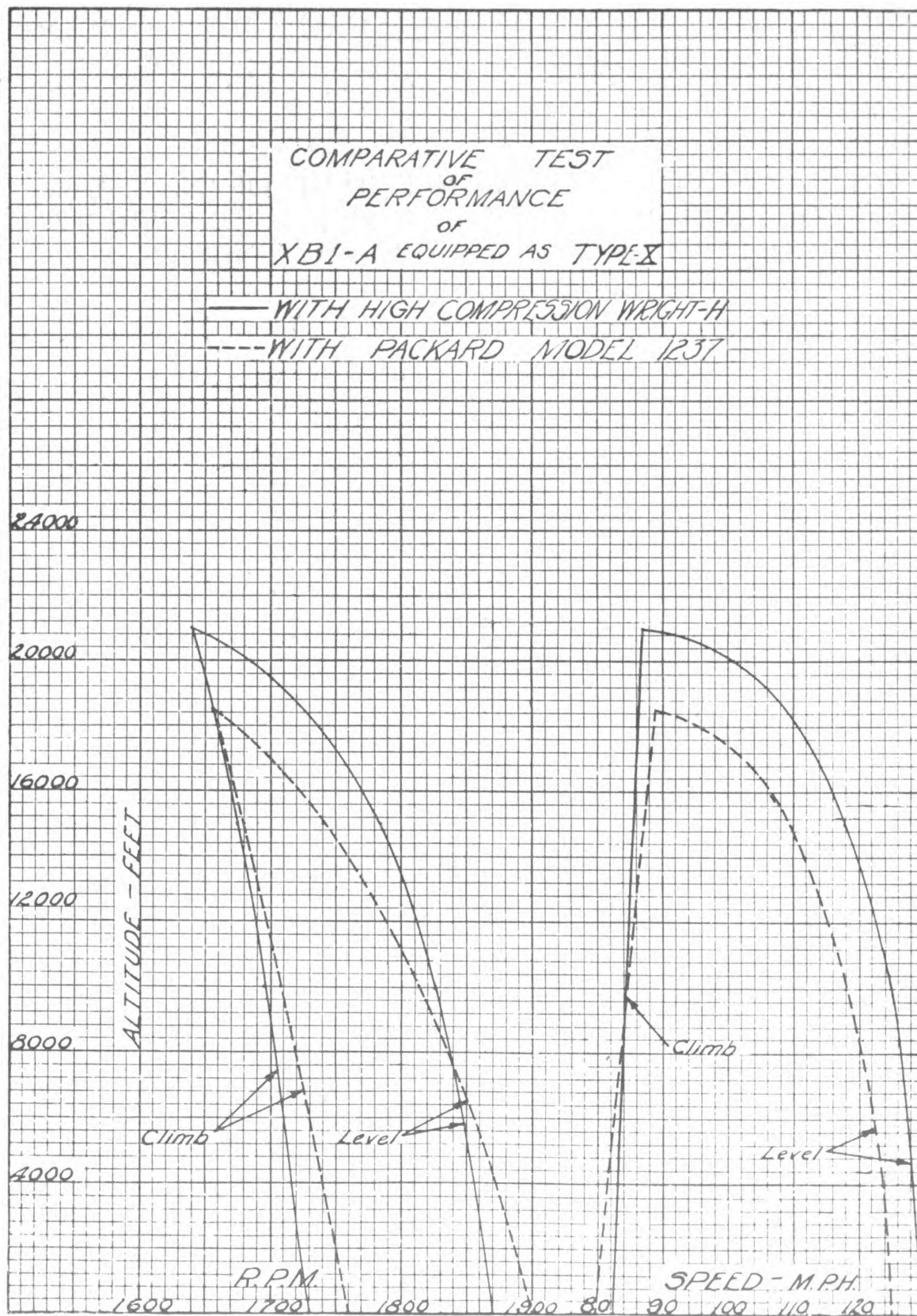


FIG. 1.

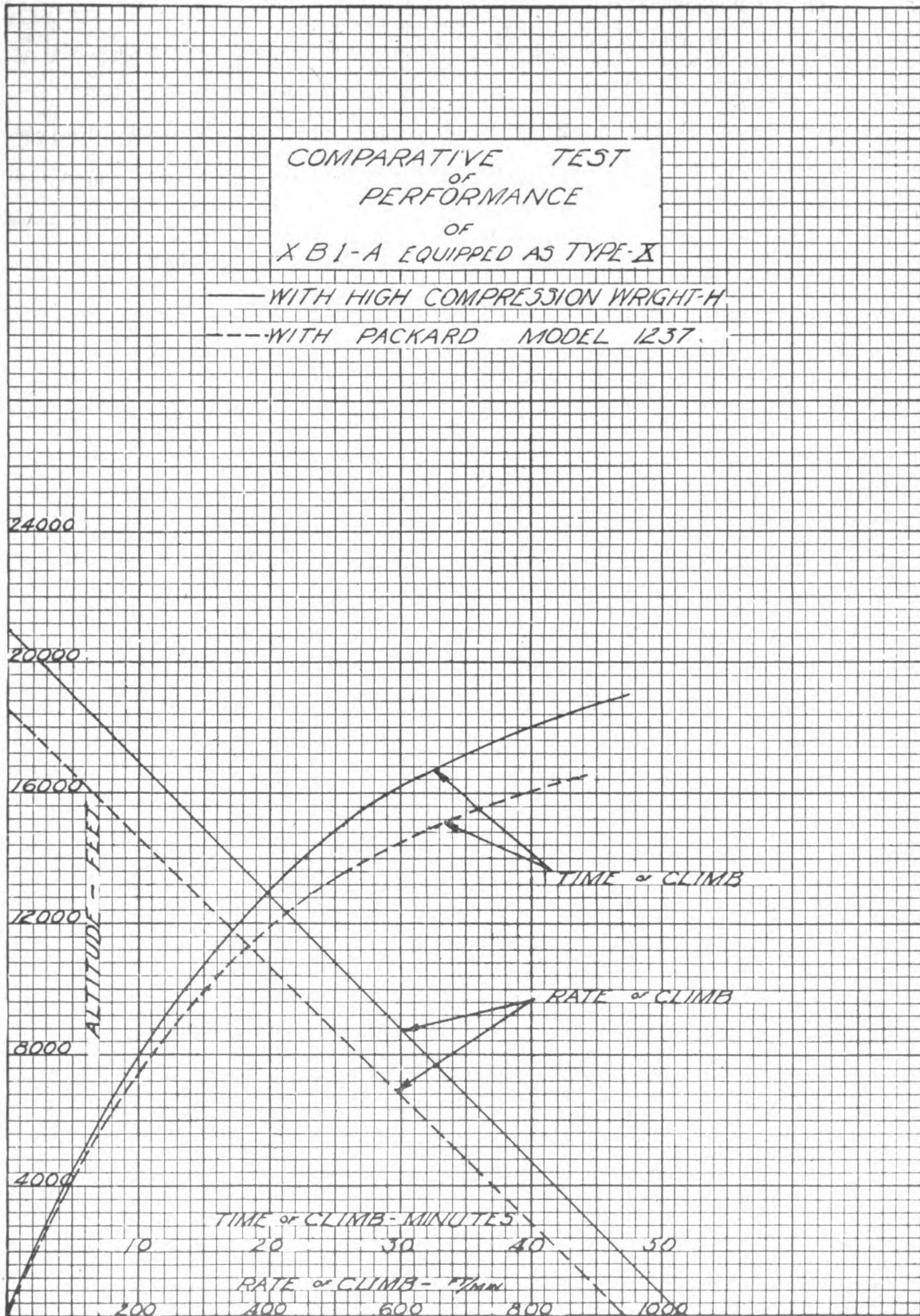


FIG. 2.

PILOTS' OBSERVATIONS.

The comparative tests conducted between the high compression Wright and Packard engines installed in type X, X. B. I.-A airplanes, demonstrated that owing to the lighter weight per horsepower and lower fuel consumption the airplane equipped with the Wright engine gave the better performance.

The test was conducted with a full military load, the longitudinal balance being corrected by use of the adjustable stabilizer. Antiknock compound No. 1 was used in both engines during the test to prevent preignition. This fuel stains, leaves a gummy residue, and the exhaust fumes are rather disagreeable to the pilot.

The Packard engine operates with little vibration, has a quick acceleration, and cools well during climb, but could be operated with a smaller radiator, which would improve the performance. Approximately 100 revolutions per minute were lost during the climb, and when attempting to increase the revolutions per minute the altitude control was found to be so sensitive that there was danger of cutting the engine.

The Wright engine has an efficient altitude control, good acceleration, cools well, and shows a loss of 70 revolutions per minute in climb. The engine is steady at high speed, but has considerable vibration at low revolution per minute. A great improvement was noticeable in the performance of this engine as compared with the low-compression Wright 300.

No trouble of a serious nature was encountered with either engine during the test, but the endurance has not been determined.

O. G. KELLY,
First Lieutenant, A. S., Test Pilot.
LOUIS G. MEISTER,
Test Pilot.

DISTRIBUTION OF WEIGHTS.

X. B. I.-A, P-90.

(By pounds.)

Weight empty (with water): 2,155

Armament and equipment: 611.

Crew: 360.

Gasoline: 598.

Oil: 67.

Weight loaded: 3,791.

Weight on front wheels (tail skid on ground): 3,396.

Weight on tail skid (tail skid on ground): 395.

Weight on front wheels (flying position): 3,591.

Weight on tail skid (flying position): 200.

Center of gravity (distance from wheels in flying position): 10.8 inches.

Distance center line of wheels to point of support of tail skid: 200 inches.

Provisions for special equipment not carried during test.

X. B. I.-A, P-180.

(By pounds.)

Weight empty (with water): 2,305.

Armament and equipment: 611.

Crew: 360.

Gasoline: 638.

Oil: 74.

Weight loaded: 3,988.

Weight on front wheels (tail skid on ground): 3,515.

Weight on tail skid (tail skid on ground): 473.

Weight on front wheels (flying position): 3,732.

Weight on tail skid (flying position): 256.

Center of gravity (distance from wheels in flying position): 13.1 inches.

Distance center line of wheels to point of support of tail skid: 200 inches.

Provisions for special equipment not carried during test.

DESCRIPTION OF AIRPLANE.

DIMENSIONS.

Over-all span: 39 feet $4\frac{1}{8}$ inches.

Over-all length: 25 feet 6 inches.

Over-all height: 9 feet $9\frac{1}{2}$ inches.

Height at hub of propeller above ground:

In flying position: 5 feet $7\frac{1}{2}$ inches.

At rest: ———.

AIRPLANES.

Wing curve: R. A. F., 15.

Sweep back: None.

Dihedral: $3^{\circ} 30'$.

Stagger: 1 foot 6 inches.

Total area, including ailerons: 405.6 square feet.

Gap: 5 feet 5 inches.

UPPER PLANE.

(Including center section.)

Span: 39 feet $4\frac{1}{8}$ inches.

Chord: 5 feet 6 inches.

Area, with ailerons: 202 square feet.

Incidence: 2° .

LOWER PLANE.

Span: 39 feet $4\frac{1}{8}$ inches.

Chord: 5 feet 6 inches.

Area: 202 square feet.

Incidence: $1^{\circ} 45'$.

AILERONS OR FLAPS.

Number: 4.

Arrangement: 2 upper; 2 lower.

Upper length: 7 feet $1\frac{1}{8}$ inches.

Upper chord: 1 foot $11\frac{1}{8}$ inches.

Upper area: 13 square feet.

Lower length: 7 feet $1\frac{1}{8}$ inches.

Lower chord: 1 foot $11\frac{1}{8}$ inches.

Lower area: 13 square feet.

Total area: 26 square feet.

Distance from center of ailerons to longitudinal axis of airplane: 16 feet $\frac{1}{2}$ inch.

CENTER SECTION.

(Upper.)

Area: 4 feet $3\frac{1}{8}$ inches.

Dimensions: 4 feet $\frac{1}{2}$ inch.

Contents: Gravity gas tank.

STABILIZER.

Area: 22.5 square feet.
Setting: Adjustable.

ELEVATOR.

Area: 23 square feet.
Distance from leading edge of elevator to center of gravity of airplane: 16 feet 11 inches.

RUDDER.

Area: 4 feet 2½ inches.
Distance from leading edge of rudder to center of gravity of airplane: 16 feet 8 inches.

FUSELAGE.

Maximum cross-section shape: 3 feet 5½ inches.
Maximum cross-section area: ———.
Maximum cross-section dimension: 2 feet 8 inches.
Distance of maximum section from leading edge, lower plane: ———.

LANDING GEAR.

Number of wheels: 2.
Tread: 5 feet 6 inches.
Shock absorbing system: rubber cord.
Braking device: Tail skid.
Wheels ahead of center of gravity: 1 foot 3½ inches.

FIN.

Area: 10.3 square feet.

DESCRIPTION OF POWER PLANT.**ENGINE.**

Make: Packard.
Factory No.: ———.
A. S. No.: 94603.
Type: Vee-12 cylinder.
Number in plane: 1.
Location: Nose of fuselage.
Rated h. p.: 300.
Rated r. p. m.: 1,800.
Bore: 5-inch.
Stroke: 5¼-inch.
Compression ratio: 5/5 to 1.
Weight dry: 738 pounds.
Gas consumption: 0.515.
Oil consumption: 4.1 pints per b. h. p. hr.
Weight of water in engine: 39 pounds.
Remarks: ———.

IGNITION.

Battery of magneto: Magneto.
Make: Dixie.
Number: 2.
Advance: 26°.
Gas interrupter: 0.020.
Distributor: Carbon brush contact.
Plugs, make: A. C.
Type: Metal body porcelain insulator.
Gap: 0.015.
Remarks: ———.

CARBURETORS.

Make: Zenith.
Type: Single Venturi Duplex Packard Zenith.
Number: 1.
Setting jet: 165.
Choke: 31 m. m.
Compensator: ———.
Gas drains: 1.

Air intake: Led into slip stream, below fuselage.
Mixture control: Standard.
Effect to altitude: ———.
Remarks: ———.

RADIATORS.

Make: ———.
Type: Honeycomb.
Number: 1.
Position: Nose of fuselage.
Frontal area: 4.8 square feet.
Depth: 5 inches.
Length: 41 inches.
Width: 28 feet.
Radiator surface: 235 square feet.
Temperature adjustment: Shutters.
Water capacity: 64 pounds.
Flow, gallons per minute: 68 at 33 pounds at 3.3 pounds per square foot.
Thermometers, make: ———.
Weight: 122 pounds.
Type: Cellular.
Water capacity of whole system: 108 pounds.

EXHAUST PIPES.

Description: Short individual stacks to each cylinder, leading to manifold extending to rear as far as front cockpit.

LUBRICATION.

Capacity oil tank: 23 quarts.
Dimensions oil tank: ———.
Oil used (brand): Liberty.
Oil pressure: 60.
Oil temperature: ———.
Type pump: Gear.
Wet or dry sump: Dry sump.
If wet, capacity: ———.
Description lubrication system: Standard. Pump forces oil to main bearings, cam shafts, and by splash to cylinder walls and wrist pins.

FUEL SYSTEM.

Number of tanks: 2.
Location: Main, to rear of engine; reserve, center section upper wing.
Capacity, main, pounds: 81 gallons, 486 pounds.
Capacity, reserve, pounds, ———.
Material: ———.
Gauge: ———.
Description of fuel-supply system: Standard X. B. I.-A system, using sylphon pump.

ENGINE CONTROL.

Description: Rod and lever.

PROPELLER.

Make: Engineering Division.
Number of blades: 2.
Diameter: 8 feet 8 inches.
Pitch: 6.41 feet.
Tips: Terneplate.
Clearance: ———.
Mfg. No.: ———.
A. S. No.: 109447.
Remarks: x-24705, 01202.



FIG. 3.



FIG. 4.



FIG. 5.